

## Solving for Unknowns in Angle Pairs

Often, you will be given angles in pairs, and you will have to use the information that you have to solve for angle measures. Broadly, the steps for solving unknown values in angle pairs are first, identify the type of angle pair, as well as the facts associated with that pair type. Next, use the facts you just identified to set up an equation. Then solve for the unknown value, and if necessary, substitute the unknown in to find the measure of the angle.

Let's go over to the whiteboard to do a couple of examples.

This one asks, "What is the measure of angle EFG if the measure of angle EFH equals 73 degrees and the measure of angle GFH equals 28 degrees?" Alright, so this measure here is 73 degrees and this measure here is 28 degrees, so if we call the measure of angle EFG  $x$  then we know that  $x$  plus 28 equals 73 because these are two adjacent angles. So all we have to do to find the value of  $x$  is subtract 28 from both sides, and we get that  $x$  equals 45. That means the measure of angle EFG equals 45 degrees. Let's look at another one.

This one reads, "If the two angles below are complementary, what is the value of  $x$ ?" Well, these two angles are complementary, that means their sum is 90 degrees. So, to write that as an equation, we can say  $x$  plus 58 equals 90. You can get  $x$  by itself by subtracting 58 from both sides of this equation, and that gives us  $x$  equals 32. Let's look at another one.

This one reads, "The two angles below are a linear pair. Find the value of  $q$ , the measure of angle LMK, and the measure of angle KMH." Remember that linear pairs are supplementary angles, so to solve for  $q$  we can write  $8q$  plus 35 plus  $7q$  minus 65 equals 180. Now let's combine terms.  $8q$  plus  $7q$  is  $15q$ , and 35 plus a negative 65 is minus 30, and that's equal to 180. To get  $q$  by itself, we're going to add 30 to both sides, and that gives us  $15q$  equals 210. To isolate  $q$ , we're going to divide by 15. That gives us  $q$  equals 14. And that's the first question we were asked. Now let's solve for the angle measures. Let's solve angle LMK first. The expression for that one is  $8q$  plus 35, so that's going to be 8 times 14 plus 35. 8 times 14 is 112, and 112 plus 35 is 147. So the measure of angle LMK is 147 degrees. Now let's go through the same process for angle KMH. The expression there is  $7q$  minus 65, so that 7 times 14 minus 65. 7 times 14 is 98, and 98 minus 65 is 33, so the measure of angle KMH is equal to 33 degrees. And we can check our work by adding these two numbers together. 147 plus 33 is 180, so these are supplementary angles. Let's do another one

This one reads, "Find the value of  $x$  in the following image." Well, these two angles are vertical angles, which means they are congruent and their measures are equal, so we can write an equation:  $x$  plus 16 equals  $4x$  minus 5., because we know these have to be the same number. Now we just have to get  $x$  by itself, so let's begin by subtracting  $x$  from both sides of the equation. Those cancel out, so we're just left with 16 equals  $4x$  minus  $x$  is  $3x$ , and minus 5. Now let's add 5 to both sides of the equation to get all the constants on one side. 16 plus 5 is 21, and that's equal to  $3x$ . Now, lastly, to isolate  $x$ , we're going to divide both sides of the equation by 3. 21 divided by 3 is 7, and  $3x$  divided by 3 is  $x$ , so  $x$  equals 7.